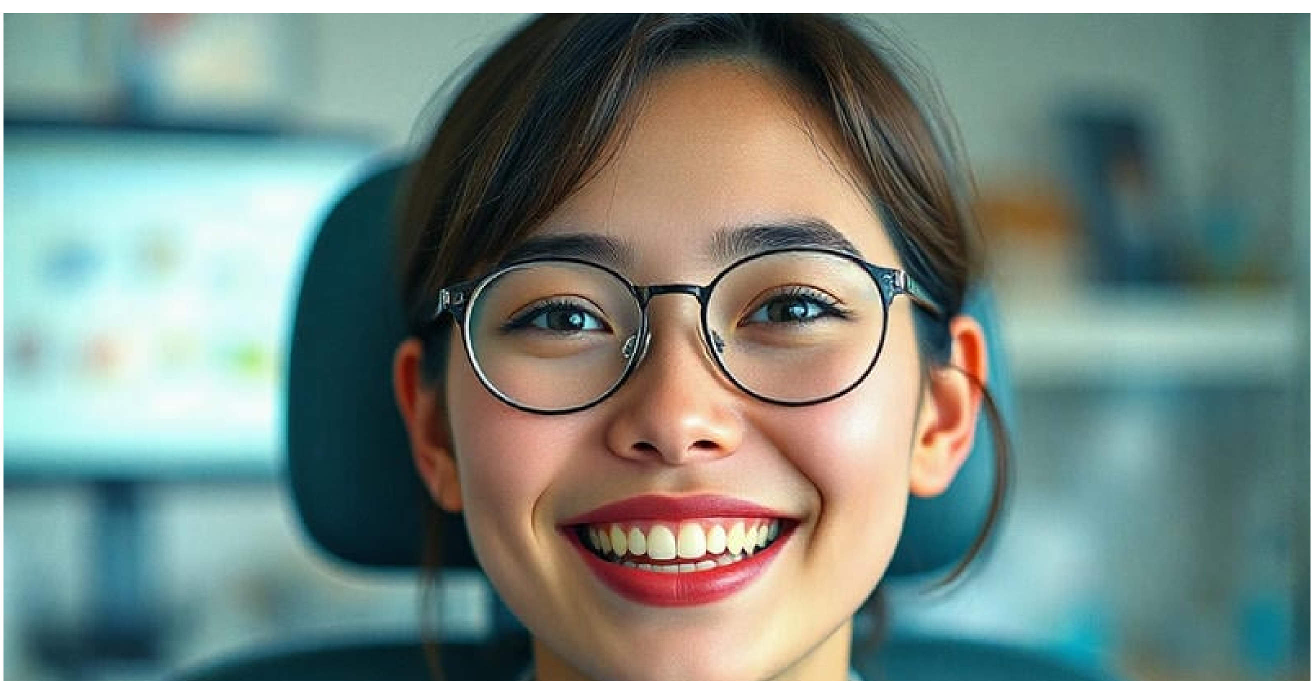
Accelerated Orthodontics

- **Innovative Approaches to Shorten Treatment Time**
  Innovative Approaches to Shorten Treatment Time The Role of Vibration Devices in Faster Tooth Movement Micro Osteoperforation and Its Effects on Treatment 3D Printing Techniques for Customized Appliances Benefits of Digital Impressions in Modern Orthodontics AI Assisted Treatment Planning for Precise Outcomes Remote Monitoring and Virtual Consultations Incorporating New Tools for Patient Compliance Practical Considerations of Accelerated Techniques Research Trends Shaping Future Orthodontic Practices Combining Traditional Methods With Cutting Edge Solutions Adapting to Technological Shifts in Orthodontic Care
  - **Indications for Surgical Alignment of the Jaw**
    Indications for Surgical Alignment of the Jaw Steps in Preparing for Orthognathic Procedures Collaboration Between Orthodontists and Surgeons Recovery Factors That Affect Surgical Outcomes Managing Expectations During Corrective Jaw Treatment Potential Complications of Complex Jaw Adjustments Importance of Skeletal Analysis Before Surgery Combined Orthodontic and Surgical Treatment Timelines Role of Virtual Surgical Planning in Jaw Corrections Functional Improvements After Orthognathic Intervention Support and Care for Post Surgical Recovery Evaluating Long Term Benefits of Jaw Realignment
    - **About Us**



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The integration of 3D printing in orthodontics has revolutionized the way customized appliances are designed and produced for kids. This technology allows for the creation of highly accurate and tailored dental devices that enhance both the efficiency and effectiveness of orthodontic treatments.

The process starts with digital scanning, where high-resolution intraoral scanners capture precise images of a patient's teeth and dental structure. These digital impressions eliminate the need for traditional, often uncomfortable, molds. The scans are then converted into detailed 3D models using specialized software, which enables orthodontists to analyze and manipulate the data to design custom appliances.

Once the design is finalized, the digital files are sent to a 3D printer. The printer layers biocompatible materials to construct the appliances, ensuring precision and speed. Post-processing involves cleaning, curing, and polishing to ensure the devices are ready for use. Orthodontic treatment plans are customized for each child's needs **Orthodontics for young children** pediatric dentistry. This meticulous process ensures that each appliance meets the necessary standards for patient care.

3D printed appliances offer several advantages for kids. They are custom-fit to the exact contours of the patient's mouth, reducing discomfort and irritation. For example, 3D printed expanders are smaller and more comfortable than traditional expanders, eliminating the need for separators and reducing speech changes. Additionally, the digital design process allows for complete customization, making the placement and removal of appliances easier and more efficient.

The use of 3D printing also streamlines the workflow for orthodontic practices, reducing the time and labor involved in creating appliances. This efficiency enables orthodontists to focus more on patient care and treatment planning, leading to better treatment outcomes and higher patient satisfaction.

By leveraging 3D printing technology, orthodontists can create a more comfortable and effective treatment experience for kids. This technology not only enhances the quality of orthodontic appliances but also represents a significant step into the future of orthodontic care.

Invisalign First is designed for children aged 6 to 10, using clear, removable aligners to address early orthodontic needs, promoting proper jaw development and teeth alignment without traditional braces. —

- **Early Intervention with Invisalign First for Kids**
- **Invisalign First is designed for children aged 6 to 10, using clear, removable aligners to address early orthodontic needs, promoting proper jaw development and teeth alignment without traditional braces.**
- **The HealthyStart System**
- **This non-invasive approach targets the natural development of children's teeth and jaw, using soft dental appliances to align teeth and address breathing issues, reducing the need for more invasive treatments.**
- **Myobrace: A No-Braces Approach**
- **Myobrace offers a brace-free solution that corrects poor oral habits, guiding jaw and teeth alignment development in children, promoting natural growth and oral health.**
- **Comprehensive Orthodontic Solutions**

The creation of 3D printed orthodontic appliances represents a significant shift in the field of orthodontics, offering unparalleled precision, speed, and customization. This process begins with digital scanning, where high-resolution intraoral scanners capture detailed images of a patient's teeth and arches. These scans eliminate the need for traditional molds, providing highly accurate data that is both quick and comfortable for patients.

Once the digital scans are complete, they are converted into 3D models using specialized software. This software allows for the manipulation and detailed design of custom orthodontic appliances tailored to each patient's unique dental structure. The digital models serve as the foundation for creating personalized treatment plans, ensuring that appliances fit comfortably and function optimally.

The final step involves printing the appliances using advanced technologies such as Stereolithography (SLA) and Digital Light Processing (DLP). SLA uses a laser to solidify liquid resin layer by layer, producing highly accurate and intricate models. DLP, on the other hand, uses a digital micromirror device to project light onto the resin surface, allowing for rapid curing of large areas. These technologies construct appliances layer by layer using biocompatible materials like resins and metals, ensuring safety and effectiveness.

After printing, the appliances undergo post-processing steps, including cleaning, curing, and polishing. This meticulous process ensures that each appliance meets the necessary standards before being delivered to the patient. The integration of 3D printing into orthodontics has revolutionized the manufacturing process, offering significant advantages over traditional methods by providing rapid production, customization, and improved treatment outcomes.

The HealthyStart System

The use of 3D printing in creating customized appliances for children has revolutionized the way orthodontic treatments are conducted, offering a range of benefits that enhance the overall patient experience. This technology allows for increased comfort, reduced chair time, and improved accuracy of fit, making it an invaluable innovation in the healthcare industry.

One of the most significant advantages of 3D printing is its ability to provide customized appliances that fit perfectly, ensuring greater comfort for children. Traditional methods often involve manual adjustments and physical molds, which can be less precise and more invasive. In contrast, 3D printing uses digital scans to create appliances tailored to each individual's dental structure, resulting in a more comfortable fit and better treatment outcomes.

Another benefit is the significant decrease in chair time. With traditional methods, creating orthodontic appliances can be a time-consuming process, often taking weeks. However, 3D printing allows for rapid production, cutting out the need for external labs and reducing wait times. This streamlined process means that children can begin their treatment sooner, reducing the overall time they need to be in the dental chair.

The accuracy of fit achieved through 3D printing is also a critical factor in the success of orthodontic treatments. Traditional methods can sometimes lead to minor inaccuracies, which may require additional adjustments. In contrast, 3D-printed appliances are designed with precision, ensuring that they apply pressure accurately and lead to quicker results with fewer adjustments needed. This not only improves the efficiency of treatment but also reduces the discomfort and time children have to experience during readjustments.

Overall, the use of 3D printing in orthodontics for kids is transforming the way treatments are conducted, offering a more comfortable, faster, and more accurate experience. This technology not only improves the patient experience but also has the potential to make high-quality orthodontic care more accessible and affordable for a broader range of children.

This non-invasive approach targets the natural development of children's teeth and jaw, using soft

dental appliances to align teeth and address breathing issues, reducing the need for more invasive treatments.

The integration of 3D printing in orthodontics, particularly for kids, has revolutionized the field by offering customized solutions that are tailored to individual dental needs. This technology allows for the creation of precise and comfortable orthodontic appliances such as expanders, aligners, and retainers.

One of the most significant applications of 3D printing in pediatric orthodontics is the creation of customized expanders. Traditional expanders often require uncomfortable separators to be used before insertion, which can be a significant discomfort for kids. In contrast, 3D printed expanders are designed to fit perfectly on the teeth, reducing the need for separators and making the treatment process much more comfortable. These expanders are smaller and sleek, reducing speech changes and making them easier to clean, which is particularly beneficial for kids.

Customized aligners are also a notable application of 3D printing in orthodontics. These aligners are designed to fit each patient's unique dental structure, ensuring a precise and comfortable fit. This level of customization not only enhances treatment effectiveness but also reduces irritation and discomfort, making it more appealing for kids to follow through with their treatment plans.

3D printed retainers offer a tailored approach to ensuring that teeth maintain their new, improved placement after orthodontic treatment. These retainers are designed to fit perfectly, reducing the likelihood of irritation and ensuring that the results of orthodontic treatment are long term.

The use of 3D printing technology in orthodontics also streamlines the production process, reducing the time and labor required to create these appliances. This not only saves costs for both practitioners and patients but also enhances patient satisfaction by providing quicker turnaround times and more effective treatment outcomes.

In the future, as 3D printing technology further improves, it is clear that its applications in pediatric orthodontics, such as customized expanders, aligners, and retainers, are only the beginning. This technology has the potential to revolutionized the way orthodontic care is provided, making treatments more precise, efficient, and comfortable for kids.

Myobrace: A No-Braces Approach

The advent of digital workflows has revolutionized the production of customized appliances, especially when complemented by 3D printing techniques. This innovative method significantly outstings traditional methods by offering streamlined production processes and a reduced need for physical impressions.

One of the most notable advantages of digital workflows is their efficiency. Traditional methods often require manual processes such as physical impression-taking and model fabrication, both of these steps are time-consuming and error-inclined. Digital workflows, on the other hand, use intraoral scanning to create precise 3D models of a patient's mouth. These models can be instantly sent to labs for fabrication, significantly expediting the production of restorations and appliances. This not only reduces chair time for patients but also accelerates case completion, allowing for faster turnaround times and improved patient satisfaction.

Another significant advantage is the accuracy and reliability that digital workflows bring. By leveraging digital tools, dental professionals can ensure that every restoration meets a high standard of quality. Automated processes like digital scanning and CAD/CAM milling reduce human error and variability, ensuring that restorations are reliable, well-fitting, and durable. This consistency builds trust with patients and reduces the likelihood of remakes, saving both time and resources.

3D printing techniques are a powerful complement to digital workflows. They enable the production of customized appliances with unparalleled precision and speed. Traditional manufacturing methods often require weeks or months to produce a part, while 3D printing can turn CAD models into physical parts within hours. This speed allows for faster prototyping and production, allowing dental practices to bring customized appliances to patients more quickly. Additionally, 3D printing reduces costs by cutting the need for expensive tooling and setup associated with traditional manufacturing methods.

In the dental industry, 3D printing is used to create a variety of appliances, including dental restorations, surgical guides, and clear aligners. These appliances can be printed with high accuracy and detail, ensuring a precise and comfortable fitting for patients. The process is also highly efficient, as designs can be sent directly to 3D printers for production, with minimal manual labor required.

In short, the use of digital workflows and 3D printing techniques in the production of customized appliances represents a significant step ahead of traditional methods. By streamlining production processes, improving accuracy, and offering faster turnaround times, these technologies enhance both the efficiency of dental practices and the satisfaction of their patients. As technology in this space continue to develop, we can expect even more innovative applications of digital workflows and 3D printing in the dental industry.

Myobrace offers a brace-free solution that corrects poor oral habits, guiding jaw and teeth

alignment development in children, promoting natural growth and oral health.

The future of 3D printing in orthodontics is filled with exciting possibilities, especially for customized appliances in treatments for kids. One of the most significant advancements is in materials science. Researchers are continuously exploring new biocompatible materials that not only ensure the safety and durability of orthodontic devices but also offer enhanced therapeutic benefits. For example, smart materials that can respond to environmental stimuli like temperature or pressure are being designed. These materials could lead to the development of dynamic, adaptive appliances that adjust during treatment, providing optimal effectiveness and improving patient outcomes.

Another crucial development is the rapid advancement in printing speeds. With faster production times, orthodontists can create custom aligners and braces in a matter of hours, significantly reducing wait times for patients. This efficiency allows for quicker treatment start times and faster progress through treatment plans, which is especially important for kids, as it can help reduce the overall treatment time and make the process more comfortable.

The integration of 3D printing with other digital technologies, such as intraoral scanners and CAD/CAM systems, is also revolutionizing orthodontic care. This integration allows for a more streamlined digital workflow, reducing the need for in-person visits and lowering costs. It also enhances the precision of customized appliances, ensuring they fit perfectly and work effectively.

Innovations like bioprinting hold the potential for even more groundbreaking advancements. The ability to create living tissues could lead to revolutionary treatments such as tooth and gingival tissue restoration. This could significantly expand the possibilities for orthodontic treatments, offering new solutions for complex dental issues.

As these technologies continue to develop, they will reshape the way orthodontic care is delivered, making it more efficient, accessible, and personalized. The future of 3D printing in orthodontics is promising, with continuous advancements in materials, printing speeds, and digital integration likely to expand the use of customized appliances in treatments for kids, providing them with more effective and comfortable care options.

Comprehensive Orthodontic Solutions

The potential for 3D printing to enhance treatment planning and outcomes is profoundly significant, particularly in the realm of customized appliances. By allowing for precise mock-ups, 3D printing facilitates a level of communication between clinicians and labs that was previously unattended. This technology offers the ability to create highly detailed and personalized models that can be used for preoperative planning, patient education, and intraoperative visualization.

For instance, in orthodontics, 3D printing is used to create customized appliances such as aligners and retainers. These devices are tailored to address the unique needs of each patient, thereby improving treatment effectiveness and allowing for adjustments as needed. The precision and efficiency of 3D printing ensure that these appliances are produced quickly and effectively, ensuring that patients receive the best possible care and treatment outcomes.

Furthermore, 3D printing has revolutionized the creation of patient-specific surgical models and instruments. These models can be used to enhance understanding and communication within surgical teams and with patients, leading to better preoperative planning and reduced operating room time. The ability to quickly iterate on designs based on surgeon feedback also allows for more accurate and efficient surgical procedures.

The integration of 3D printing into healthcare not only improves patient outcomes but also enhances the efficiency of medical procedures. By creating precise mock-ups and allowing for better communication between clinicians and labs, 3D printing technology is poised to redefine the trajectories of patient-centric care and biomedical science. As this technology advances, it will be critical to address ongoing challenges such as material biocompatibility and regulatory compliance to fully harness its transformative potential.

About tooth

This article is about teeth in general. For specifically human teeth, see Human tooth. For other uses, see Tooth (disambiguation).

Tooth	
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A chimpanzee displaying his teeth	
Details	
Identifiers	
Latin	*dens*
MeSH	D014070
FMA	12516
Anatomical terminology [edit on Wikidata]	

A **tooth** (pl.: **teeth**) is a hard, calcified structure found in the jaws (or mouths) of many vertebrates and used to break down food. Some animals, particularly carnivores and omnivores, also use teeth to help with capturing or wounding prey, tearing food, for defensive purposes, to intimidate other animals often including their own, or to carry prey or their young. The roots of teeth are covered by gums. Teeth are not made of bone, but rather of multiple tissues of varying density and hardness that originate from the outermost embryonic germ layer, the ectoderm.

The general structure of teeth is similar across the vertebrates, although there is considerable variation in their form and position. The teeth of mammals have deep roots, and this pattern is also found in some fish, and in crocodilians. In most teleost fish, however, the teeth are attached to the outer surface of the bone, while in lizards they are attached to the inner surface of the jaw by one side. In cartilaginous fish, such as sharks, the teeth are attached by tough ligaments to the hoops of cartilage that form the jaw.[1]

Monophyodonts are animals that develop only one set of teeth, while diphyodonts grow an early set of deciduous teeth and a later set of permanent or "adult" teeth. Polyphyodonts grow many sets of teeth. For example, sharks, grow a new set of teeth every two weeks to replace worn teeth. Most extant mammals including humans are diphyodonts, but there are exceptions including elephants, kangaroos, and manatees, all of which are polyphyodonts.

Rodent incisors grow and wear away continually through gnawing, which helps maintain relatively constant length. The industry of the beaver is due in part to this qualification. Some rodents, such as voles and guinea pigs (but not mice), as well as lagomorpha (rabbits, hares and pikas), have continuously growing molars in addition to incisors.[2][3] Also, tusks (in tusked mammals) grow almost throughout life.[4]

Teeth are not always attached to the jaw, as they are in mammals. In many reptiles and fish, teeth are attached to the palate or to the floor of the mouth, forming additional rows inside those on the jaws proper. Some teleosts even have teeth in the pharynx. While not true teeth in the usual sense, the dermal denticles of sharks are almost identical in structure and are likely to have the same evolutionary origin. Indeed, teeth appear to have first evolved in sharks, and are not found in the more primitive jawless fish – while lampreys do have tooth-like structures on the tongue, these are in fact, composed of keratin, not of dentine or enamel, and bear no relationship to true teeth.[1] Though "modern" teeth-like structures with dentine and enamel have been found in late conodonts, they are now supposed to have evolved independently of later vertebrates' teeth.[5][6]

Living amphibians typically have small teeth, or none at all, since they commonly feed only on soft foods. In reptiles, teeth are generally simple and conical in shape, although there is some variation between species, most notably the venom-injecting fangs of snakes. The pattern of incisors, canines, premolars and molars is found only in mammals, and to varying extents, in their evolutionary ancestors. The numbers of these types of teeth vary greatly between species; zoologists use a standardised dental formula to describe the precise pattern in any given group.[1]

Etymology

[edit]

The word *tooth* comes from Proto-Germanic **tanþs*, derived from the Proto-Indo-European **hÃ¢â€šÂ•dent-*, which was composed of the root **hÃ¢â€šÂ•ed-* 'to eat' plus the active participle suffix *-*nt*, therefore literally meaning 'that which eats'.[7]

The irregular plural form *teeth* is the result of Germanic umlaut whereby vowels immediately preceding a high vocalic in the following syllable were raised. As the nominative plural ending of the Proto-Germanic consonant stems (to which **tanþs* belonged) was *-*iz*, the root vowel in the plural form **tanþiz* (changed by this point to **tÃ„â€¦ÃŒâ€žþi* via unrelated phonological processes) was raised to /œÃ‹Â•/, and later unrounded to /eÃ‹Â•/, resulting in the *tÃ…Â•þ/tÃ„â€œþ* alternation attested from Old English. Cf. also Old English *bÃ…Â•c/bÃ„â€œÃ„â€¹* 'book/books' and 'mÃ…Â«s/mÃˆÂ³s' 'mouse/mice', from Proto-Germanic **bÃ…Â•ks/bÃ…Â•kiz* and **mÃ…Â«s/mÃ…Â«siz* respectively.

Cognate with Latin *dÃ„â€œns*, Greek Ã¡Â½â‚¬??Ã•Â•?(*odous*), and Sanskrit *dát*.

Origin

[edit]

Teeth are assumed to have evolved either from ectoderm denticles (scales, much like those on the skin of sharks) that folded and integrated into the mouth (called the "outside–in" theory), or from endoderm pharyngeal teeth (primarily formed in the pharynx of jawless vertebrates) (the "inside–out" theory). In addition, there is another theory stating that neural crest gene regulatory network, and neural crest-derived ectomesenchyme are the key to generate teeth (with any epithelium, either ectoderm or endoderm).[4][8]

The genes governing tooth development in mammals are homologous to those involved in the development of fish scales.[9] Study of a tooth plate of a fossil of the extinct fish *Romundina stellina* showed that the teeth and scales were made of the same tissues, also found in mammal teeth, lending support to the theory that teeth evolved as a modification of scales.[10]

Mammals

[edit]
Main article: Mammal tooth

Teeth are among the most distinctive (and long-lasting) features of mammal species. Paleontologists use teeth to identify fossil species and determine their relationships. The shape of the animal's teeth are related to its diet. For example, plant matter is hard to digest, so herbivores have many molars for chewing and grinding. Carnivores, on the other hand, have canine teeth to kill prey and to tear meat.

Mammals, in general, are diphyodont, meaning that they develop two sets of teeth. In humans, the first set (the "baby", "milk", "primary" or "deciduous" set) normally starts to appear at about six months of age, although some babies are born with one or more visible teeth, known as neonatal teeth. Normal tooth eruption at about six months is known as teething and can be painful. Kangaroos, elephants, and manatees are unusual among mammals because they are polyphyodonts.

Aardvark

[edit]

In aardvarks, teeth lack enamel and have many pulp tubules, hence the name of the order Tubulidentata.[11]

Canines

[edit]

In dogs, the teeth are less likely than humans to form dental cavities because of the very high pH of dog saliva, which prevents enamel from demineralizing.[12] Sometimes called cuspids, these teeth are shaped like points (cusps) and are used for tearing and grasping food.[13]

Cetaceans

[edit]
Main article: Baleen

Like human teeth, whale teeth have polyp-like protrusions located on the root surface of the tooth. These polyps are made of cementum in both species, but in human teeth, the protrusions are located on the outside of the root, while in whales the nodule is located on the inside of the pulp chamber. While the roots of human teeth are made of cementum on the outer surface, whales have cementum on the entire surface of the tooth with a very small layer of enamel at the tip. This small enamel layer is only seen in older whales where the cementum has been worn away to show the underlying enamel.[14]

The toothed whale is a parvorder of the cetaceans characterized by having teeth. The teeth differ considerably among the species. They may be numerous, with some dolphins bearing over 100 teeth in their jaws. On the other hand, the narwhals have a giant unicorn-like tusk, which is a tooth containing millions of sensory pathways and used for sensing during feeding, navigation, and mating. It is the most neurologically complex tooth known. Beaked whales are almost toothless, with only bizarre teeth found in males. These teeth may be used for feeding but also for demonstrating aggression and showmanship.

Primates

[edit]
Main articles: Human tooth and Dental anatomy

In humans (and most other primates), there are usually 20 primary (also "baby" or "milk") teeth, and later up to 32 permanent teeth. Four of these 32 may be third molars or wisdom teeth, although these are not present in all adults, and may be removed surgically later in life.[15]

Among primary teeth, 10 of them are usually found in the maxilla (i.e. upper jaw) and the other 10 in the mandible (i.e. lower jaw). Among permanent teeth, 16 are found in the maxilla and the other 16 in the mandible. Most of the teeth have uniquely distinguishing features.

Horse

[edit]
Main article: Horse teeth

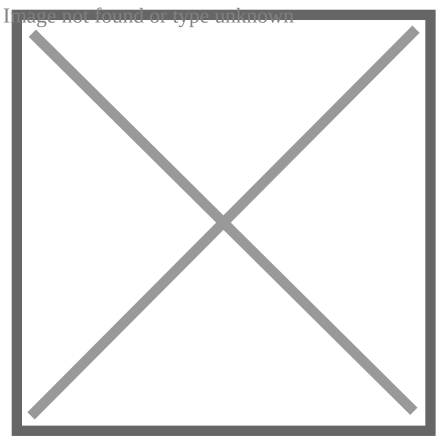
An adult horse has between 36 and 44 teeth. The enamel and dentin layers of horse teeth are intertwined.[16] All horses have 12 premolars, 12 molars, and 12 incisors.[17] Generally, all male equines also have four canine teeth (called tushes) between the molars and incisors. However, few female horses (less than 28%) have canines, and those that do usually have only one or two, which many times are only partially erupted.[18] A few horses have one to four wolf teeth, which are vestigial premolars, with most of those having only one or two. They are equally common in male and female horses and much more likely to be on the upper jaw. If present these can cause problems as they can interfere with the horse's bit contact. Therefore, wolf teeth are commonly removed.[17]

Horse teeth can be used to estimate the animal's age. Between birth and five years, age can be closely estimated by observing the eruption pattern on milk teeth and then permanent teeth. By age five, all permanent teeth have usually erupted. The horse is then said to have a "full" mouth. After the age of five, age can only be conjectured by studying the wear patterns on the incisors, shape, the angle at which the incisors meet, and other factors. The wear of teeth may also be affected by diet, natural abnormalities, and cribbing. Two horses of the same age may have different wear patterns.

A horse's incisors, premolars, and molars, once fully developed, continue to erupt as the grinding surface is worn down through chewing. A young adult horse will have teeth, which are 110–130 mm (4.5–5 inches) long, with the majority of the crown remaining below the gumline in the dental socket. The rest of the tooth will slowly emerge from the jaw, erupting about 3 mm (1?8 in) each year, as the horse ages. When the animal reaches old age, the crowns of the teeth are very short and the teeth are often lost altogether. Very old horses, if lacking molars, may need to have their fodder ground up and soaked in water to create a soft mush for them to eat in order to obtain adequate nutrition.

Proboscideans

[edit]



Section through the ivory tusk of a mammoth

Main article: Elephant ivory

Elephants' tusks are specialized incisors for digging food up and fighting. Some elephant teeth are similar to those in manatees, and elephants are believed to have undergone an aquatic phase in their evolution.

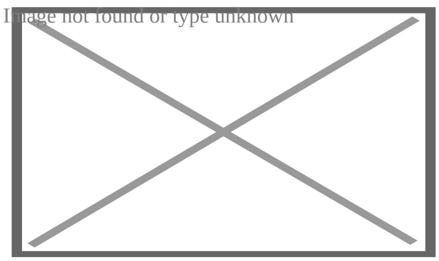
At birth, elephants have a total of 28 molar plate-like grinding teeth not including the tusks. These are organized into four sets of seven successively larger teeth which the elephant will slowly wear through during its lifetime of chewing rough plant material. Only four teeth are used for chewing at a given time, and as each tooth wears out, another tooth moves forward to take its place in a process similar to a conveyor belt. The last and largest of these teeth usually becomes exposed when the animal is around 40 years of age, and will often last for an additional 20 years. When the last of these teeth has fallen out, regardless of the elephant's age, the animal will no longer be able to chew food and will die of starvation.[19][20]

Rabbit

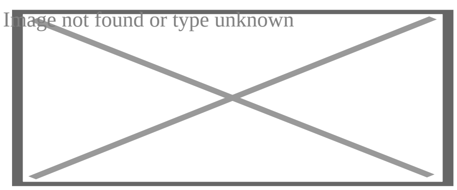
[edit]

Rabbits and other lagomorphs usually shed their deciduous teeth before (or very shortly after) their birth, and are usually born with their permanent teeth.[21] The teeth of rabbits complement their diet, which consists of a wide range of vegetation. Since many of the foods are abrasive enough to cause attrition, rabbit teeth grow continuously throughout life.[22] Rabbits have a total of six incisors, three upper premolars, three upper molars, two lower premolars, and two lower molars on each side. There are no canines. Dental formula is $\frac{2.0.3.3}{1.0.2.3}$ = 28. Three to four millimeters of the tooth is worn away by incisors every week, whereas the cheek teeth require a month to wear away the same amount.[23]

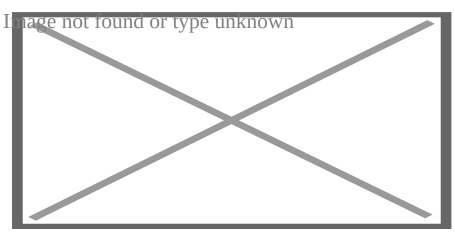
The incisors and cheek teeth of rabbits are called aradicular hypsodont teeth. This is sometimes referred to as an elodent dentition. These teeth grow or erupt continuously. The growth or eruption is held in balance by dental abrasion from chewing a diet high in fiber.



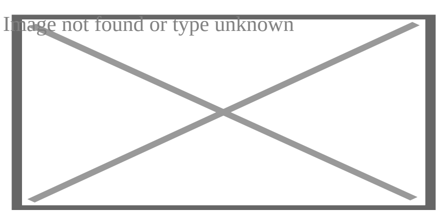
Buccal view of top incisor from *Rattus rattus*. Top incisor outlined in yellow. Molars circled in blue.



Buccal view of the lower incisor from the right dentary of a *Rattus rattus*



Lingual view of the lower incisor from the right dentary of a *Rattus rattus*



Midsagittal view of top incisor from *Rattus rattus*. Top incisor outlined in yellow. Molars circled in blue.

Rodents

[edit]

Rodents have upper and lower hypselodont incisors that can continuously grow enamel throughout its life without having properly formed roots.[24] These teeth are also known as aradicular teeth, and unlike humans whose ameloblasts die after tooth development, rodents continually produce enamel, they must wear down their teeth by gnawing on various materials.[25] Enamel and dentin are produced by the enamel organ, and growth is dependent on the presence of stem cells, cellular amplification, and cellular maturation structures in the odontogenic region.[26] Rodent incisors are used for cutting wood, biting through the skin of fruit, or for defense. This allows for the rate of wear and tooth growth to be at equilibrium.[24] The microstructure of rodent incisor enamel has shown to be useful in studying the phylogeny and systematics of rodents because of its independent evolution from the other dental traits. The enamel on rodent incisors are composed of two layers: the inner portio interna (PI) with Hunter-Schreger bands (HSB) and an outer portio externa (PE) with radial enamel (RE).[27] It usually involves the differential regulation of the epithelial stem cell niche in the tooth of two rodent species, such as guinea pigs.[28][29]

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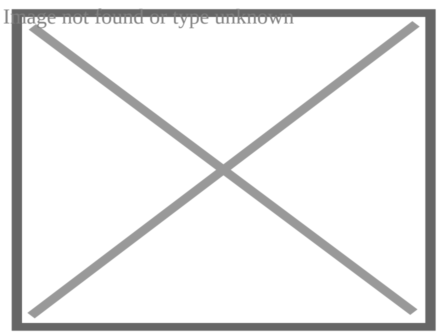


Lingual view of top incisor from Rattus rattus. Top incisor outlined in yellow. Molars circled in blue.

The teeth have enamel on the outside and exposed dentin on the inside, so they self-sharpen during gnawing. On the other hand, continually growing molars are found in some rodent species, such as the sibling vole and the guinea pig.[28][29] There is variation in the dentition of the rodents, but generally, rodents lack canines and premolars, and have a space between their incisors and molars, called the diastema region.

Manatee

[edit]

Manatees are polyphyodont with mandibular molars developing separately from the jaw and are encased in a bony shell separated by soft tissue.[30][31]

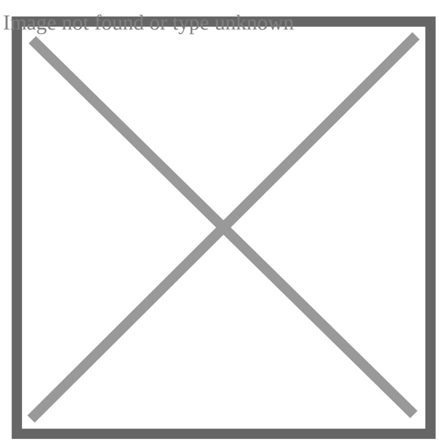
Walrus

[edit]
Main article: Walrus ivory

Walrus tusks are canine teeth that grow continuously throughout life.[32]

Fish

[edit]



Teeth of a great white shark

See also: Pharyngeal teeth and Shark tooth

Fish, such as sharks, may go through many teeth in their lifetime. The replacement of multiple teeth is known as polyphyodontia.

A class of prehistoric shark are called cladodonts for their strange forked teeth.

Unlike the continuous shedding of functional teeth seen in modern sharks,[33][34] the majority of stem chondrichthyan lineages retained all tooth generations developed throughout the life of the animal.[35] This replacement mechanism is exemplified by the tooth whorl-based dentitions of acanthodians,[36] which include the oldest known toothed vertebrate, *Qianodus duplicis*[37].

Amphibians

[edit]

All amphibians have pedicellate teeth, which are modified to be flexible due to connective tissue and uncalcified dentine that separates the crown from the base of the tooth.[38]

Most amphibians exhibit teeth that have a slight attachment to the jaw or acrodont teeth. Acrodont teeth exhibit limited connection to the dentary and have little enervation.[39] This is ideal for organisms who mostly use their teeth for grasping, but not for crushing and allows for rapid regeneration of teeth at a low energy cost. Teeth are usually lost in the course of feeding if the prey is struggling. Additionally, amphibians that undergo a metamorphosis develop bicuspid shaped teeth.[40]

Reptiles

[edit]

The teeth of reptiles are replaced constantly throughout their lives. Crocodilian juveniles replace teeth with larger ones at a rate as high as one new tooth per socket every month. Once mature, tooth replacement rates can slow to two years and even longer. Overall, crocodilians may use 3,000 teeth from birth to death. New teeth are created within old teeth.[41]

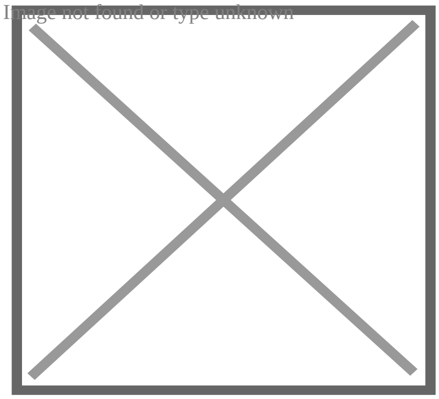
Birds

[edit]
Main article: Ichthyornis

A skull of Ichthyornis discovered in 2014 suggests that the beak of birds may have evolved from teeth to allow chicks to escape their shells earlier, and thus avoid predators and also to penetrate protective covers such as hard earth to access underlying food.[42][43]

Invertebrates

[edit]

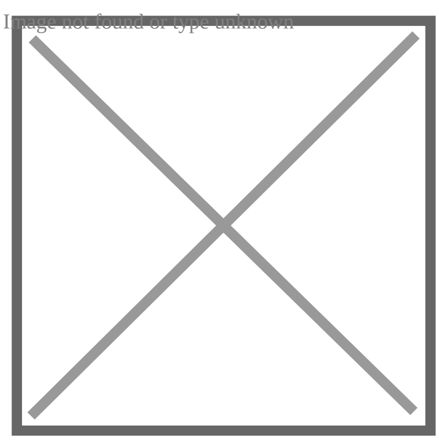


The European medicinal leech has three jaws with numerous sharp teeth which function like little saws for incising a host.

True teeth are unique to vertebrates,[44] although many invertebrates have analogous structures often referred to as teeth. The organisms with the simplest genome bearing such tooth-like structures are perhaps the parasitic worms of the family Ancylostomatidae.[45] For example, the hookworm *Necator americanus* has two dorsal and two ventral cutting plates or teeth around the anterior margin of the buccal capsule. It also has a pair of subdorsal and a pair of subventral teeth located close to the rear.[46]

Historically, the European medicinal leech, another invertebrate parasite, has been used in medicine to remove blood from patients.[47] They have three jaws (tripartite) that resemble saws in both appearance and function, and on them are about 100 sharp teeth used to incise the host. The incision leaves a mark that is an inverted Y inside of a circle. After piercing the skin and injecting anticoagulants (hirudin) and anaesthetics, they suck out blood, consuming up to ten times their body weight in a single meal.[48]

In some species of Bryozoa, the first part of the stomach forms a muscular gizzard lined with chitinous teeth that crush armoured prey such as diatoms. Wave-like peristaltic contractions then move the food through the stomach for digestion.[49]



The limpet rasps algae from rocks using teeth with the strongest known tensile strength of any biological material.

Molluscs have a structure called a radula, which bears a ribbon of chitinous teeth. However, these teeth are histologically and developmentally different from vertebrate teeth and are unlikely to be homologous. For example, vertebrate teeth develop from a neural crest mesenchyme-derived dental papilla, and the neural crest is specific to vertebrates, as are tissues such as enamel.[44]

The radula is used by molluscs for feeding and is sometimes compared rather inaccurately to a tongue. It is a minutely toothed, chitinous ribbon, typically used for scraping or cutting food before the food enters the oesophagus. The radula is unique to molluscs, and is found in every class of mollusc apart from bivalves.

Within the gastropods, the radula is used in feeding by both herbivorous and carnivorous snails and slugs. The arrangement of teeth (also known as denticles) on the radula ribbon varies considerably from one group to another as shown in the diagram on the left.

Predatory marine snails such as the Naticidae use the radula plus an acidic secretion to bore through the shell of other molluscs. Other predatory marine snails, such as the Conidae, use a specialized radula tooth as a poisoned harpoon. Predatory pulmonate land slugs, such as the ghost slug, use elongated razor-sharp teeth on the radula to seize and devour earthworms. Predatory cephalopods, such as squid, use the radula for cutting prey.

In most of the more ancient lineages of gastropods, the radula is used to graze by scraping diatoms and other microscopic algae off rock surfaces and other substrates. Limpets scrape algae from rocks using radula equipped with exceptionally hard rasping teeth.[50] These teeth have the strongest known tensile strength of any biological material, outperforming spider silk.[50] The mineral protein of the limpet teeth can withstand a tensile stress of 4.9 GPa, compared to 4 GPa of spider silk and 0.5 GPa of human teeth.[51]

Fossilization and taphonomy

[edit]

Because teeth are very resistant, often preserved when bones are not,[52] and reflect the diet of the host organism, they are very valuable to archaeologists and palaeontologists.[53] Early fish such as the thelodonts had scales composed of dentine and an enamel-like compound, suggesting that the origin of teeth was from scales which were retained in the mouth. Fish as early as the late Cambrian had dentine in their exoskeletons, which may have functioned in defense or for sensing their environments.[54] Dentine can be as hard as the rest of teeth and is composed of collagen fibres, reinforced with hydroxyapatite.[54]

Though teeth are very resistant, they also can be brittle and highly susceptible to cracking.[55] However, cracking of the tooth can be used as a diagnostic tool for predicting bite force. Additionally, enamel fractures can also give valuable insight into the diet and behaviour of archaeological and fossil samples.

Decalcification removes the enamel from teeth and leaves only the organic interior intact, which comprises dentine and cementine.[56] Enamel is quickly decalcified in acids,[57] perhaps by dissolution by plant acids or via diagenetic solutions, or in the stomachs of vertebrate predators.[56] Enamel can be lost by abrasion or spalling,[56] and is lost before dentine or bone are destroyed by the fossilisation process.[57] In such a case, the 'skeleton' of the teeth would consist of the dentine, with a hollow pulp cavity.[56] The organic part of dentine, conversely, is destroyed by alkalis.[57]

See also

[edit]

- icon Image not found or type unknown Medicine portal
- Animal tooth development
- Dragon's teeth (mythology)

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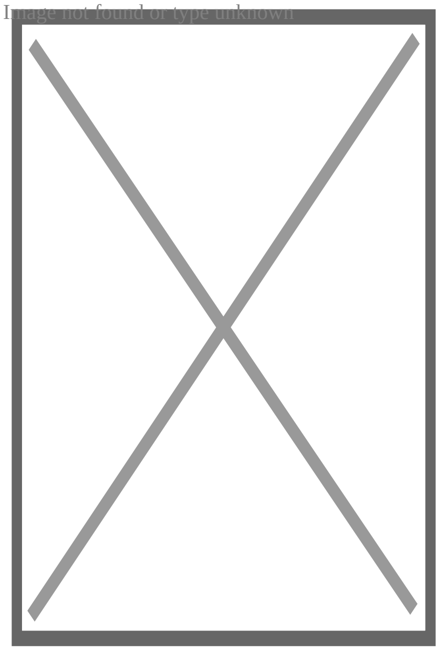
- various dental specialists

Dentistry



A dentist treats a patient with the help of a dental assistant.

Occupation

Names	◦ Dentist ◦ Dental Surgeon ◦ Doctor [1][nb 1]
Occupation type	Profession
Activity sectors	Health care, Anatomy, Physiology, Pathology, Medicine, Pharmacology, Surgery

Description

Competencies	
Education required	Dental Degree
Fields of employment	
Related jobs	

ICD-9-CM	23-24
MeSH	D003813

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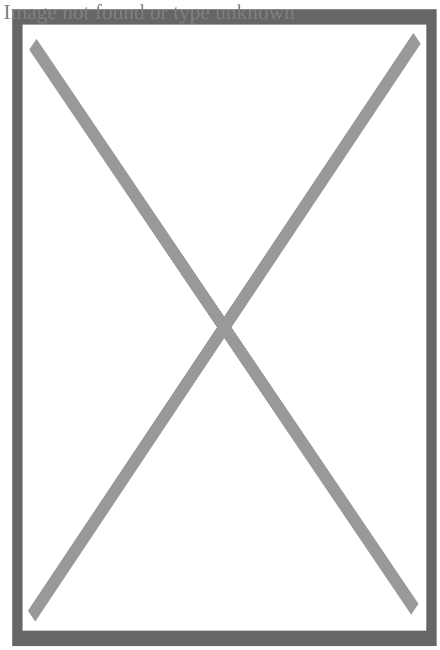

An oral surgeon and dental assistant removing a wisdom tooth

Dentistry, also known as **dental medicine** and **oral medicine**, is the branch of medicine focused on the teeth, gums, and mouth. It consists of the study, diagnosis, prevention, management, and treatment of diseases, disorders, and conditions of the mouth, most commonly focused on dentition (the development and arrangement of teeth) as well as the oral mucosa.[2] Dentistry may also encompass other aspects of the craniofacial complex including the temporomandibular joint. The practitioner is called a dentist.

The history of dentistry is almost as ancient as the history of humanity and civilization, with the earliest evidence dating from 7000 BC to 5500 BC.[3] Dentistry is thought to have been the first specialization in medicine which has gone on to develop its own accredited degree with its own specializations.[4] Dentistry is often also understood to subsume the now largely defunct medical specialty of stomatology (the study of the mouth and its disorders and diseases) for which reason the two terms are used interchangeably in certain regions. However, some specialties such as oral and maxillofacial surgery (facial reconstruction) may require both medical and dental degrees to accomplish. In European history, dentistry is considered to have stemmed from the trade of barber surgeons.[5]

Dental treatments are carried out by a dental team, which often consists of a dentist and dental auxiliaries (such as dental assistants, dental hygienists, dental technicians, and dental therapists). Most dentists either work in private practices (primary care), dental hospitals, or (secondary care) institutions (prisons, armed forces bases, etc.).

The modern movement of evidence-based dentistry calls for the use of high-quality scientific research and evidence to guide decision-making such as in manual tooth conservation, use of fluoride water treatment and fluoride toothpaste, dealing with oral diseases such as tooth decay and periodontitis, as well as systematic diseases such as osteoporosis, diabetes, celiac disease, cancer, and HIV/AIDS which could also affect the oral cavity. Other practices relevant to evidence-based dentistry include radiology of the mouth to inspect teeth deformity or oral malaises, haematology (study of blood) to avoid bleeding complications during dental surgery, cardiology (due to various severe complications arising from dental surgery with patients with heart disease), etc.

Terminology

[edit]

The term dentistry comes from *dentist*, which comes from French *dentiste*, which comes from the French and Latin words for tooth.[6] The term for the associated scientific study of teeth is **odontology** (from Ancient Greek: Ã¡Â½â‚¬??Ã•Â•‚?romanized: *odoús*, lit. 'tooth') – the study of the structure, development, and abnormalities of the teeth.

Dental treatment

[edit]

Dentistry usually encompasses practices related to the oral cavity.[7] According to the World Health Organization, oral diseases are major public health problems due to their high incidence and prevalence across the globe, with the disadvantaged affected more than other socio-economic groups.[8]

The majority of dental treatments are carried out to prevent or treat the two most common oral diseases which are dental caries (tooth decay) and periodontal disease (gum disease or pyorrhea). Common treatments involve the restoration of teeth, extraction or surgical removal of teeth, scaling and root planing, endodontic root canal treatment, and cosmetic dentistry[9]

By nature of their general training, dentists, without specialization can carry out the majority of dental treatments such as restorative (fillings, crowns, bridges), prosthetic (dentures), endodontic (root canal) therapy, periodontal (gum) therapy, and extraction of teeth, as well as performing examinations, radiographs (x-rays), and diagnosis. Dentists can also prescribe medications used in the field such as antibiotics, sedatives, and any other drugs used in patient management. Depending on their licensing boards, general dentists may be required to complete additional training to perform sedation, dental implants, etc.

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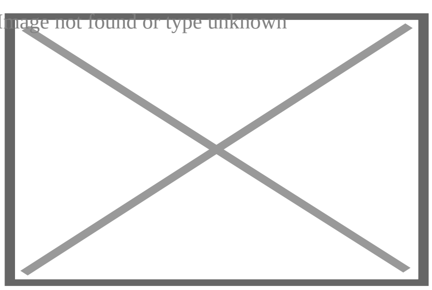

Irreversible enamel defects caused by an untreated celiac disease. They may be the only clue to its diagnosis, even in absence of gastrointestinal symptoms, but are often confused with fluorosis, tetracycline discoloration, acid reflux or other causes.[10][11][12] The National Institutes of Health include a dental exam in the diagnostic protocol of celiac disease.[10]

Dentists also encourage the prevention of oral diseases through proper hygiene and regular, twice or more yearly, checkups for professional cleaning and evaluation. Oral infections and inflammations may affect overall health and conditions in the oral cavity may be indicative of systemic diseases, such as osteoporosis, diabetes, celiac disease or cancer.[7][10][13][14] Many studies have also shown that gum disease is associated with an increased risk of diabetes, heart disease, and preterm birth. The concept that oral health can affect systemic health and disease is referred to as "oral-systemic health".

Education and licensing

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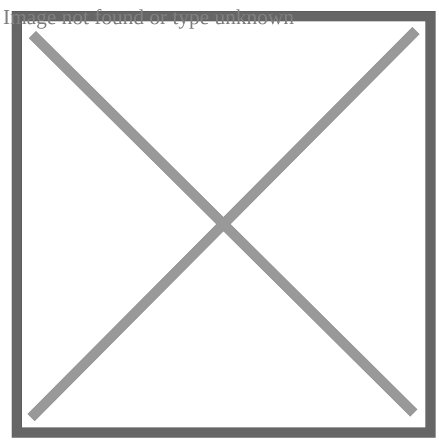
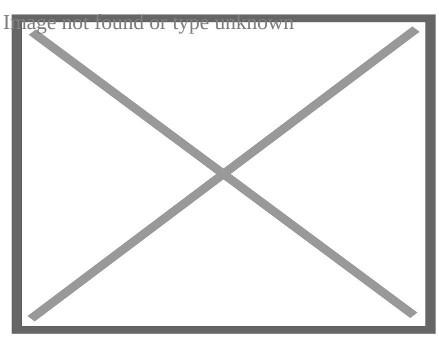
Main article: Dentistry throughout the world



A sagittal cross-section of a molar tooth; 1: crown, 2: root, 3: enamel, 4: dentin and dentin tubules, 5: pulp chamber, 6: blood vessels and nerve, 7: periodontal ligament, 8: apex and periapical region, 9: alveolar bone



Early dental chair in Pioneer West Museum in Shamrock, Texas

John M. Harris started the world's first dental school in Bainbridge, Ohio, and helped to establish dentistry as a health profession. It opened on 21 February 1828, and today is a dental museum.[15] The first dental college, Baltimore College of Dental Surgery, opened in Baltimore, Maryland, US in 1840. The second in the United States was the Ohio College of Dental Surgery, established in Cincinnati, Ohio, in 1845.[16] The Philadelphia College of Dental Surgery followed in 1852.[17] In 1907, Temple University accepted a bid to incorporate the school.

Studies show that dentists that graduated from different countries,[18] or even from different dental schools in one country,[19] may make different clinical decisions for the same clinical condition. For example, dentists that graduated from Israeli dental schools may recommend the removal of asymptomatic impacted third molar (wisdom teeth) more often than dentists that graduated from Latin American or Eastern European dental schools.[20]

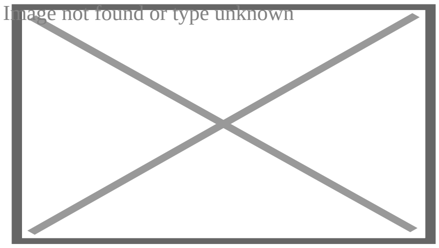
In the United Kingdom, the first dental schools, the London School of Dental Surgery and the Metropolitan School of Dental Science, both in London, opened in 1859.[21] The British Dentists Act of 1878 and the 1879 Dentists Register limited the title of "dentist" and "dental surgeon" to qualified and registered practitioners.[22][23] However, others could legally describe themselves as "dental experts" or "dental consultants".[24] The practice of dentistry in the United Kingdom became fully regulated with the 1921 Dentists Act, which required the registration of anyone practising dentistry.[25] The British Dental Association, formed in 1880 with Sir John Tomes as president, played a major role in prosecuting dentists practising illegally.[22] Dentists in the United Kingdom are now regulated by the General Dental Council.

In many countries, dentists usually complete between five and eight years of post-secondary education before practising. Though not mandatory, many dentists choose to complete an internship or residency focusing on specific aspects of dental care after they have received their dental degree. In a few countries, to become a qualified dentist one must usually complete at least four years of postgraduate study;[26] Dental degrees awarded around the world include the Doctor of Dental Surgery (DDS) and Doctor of Dental Medicine (DMD) in North America (US and Canada), and the Bachelor of Dental Surgery/Baccalaureus Dentalis Chirurgiae (BDS, BDent, BChD, BDSc) in the UK and current and former British Commonwealth countries.

All dentists in the United States undergo at least three years of undergraduate studies, but nearly all complete a bachelor's degree. This schooling is followed by four years of dental school to qualify as a "Doctor of Dental Surgery" (DDS) or "Doctor of Dental Medicine" (DMD). Specialization in dentistry is available in the fields of Anesthesiology, Dental Public Health, Endodontics, Oral Radiology, Oral and Maxillofacial Surgery, Oral Medicine, Orofacial Pain, Pathology, Orthodontics, Pediatric Dentistry (Pedodontics), Periodontics, and Prosthodontics.[27]

Specialties

[edit]
Main article: Specialty (dentistry)



A modern dental clinic in Lappeenranta, Finland

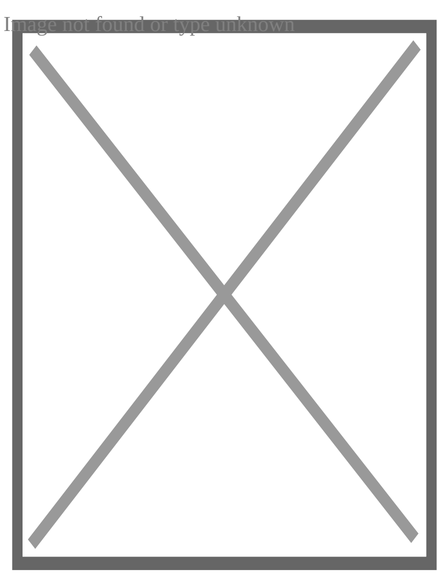
Some dentists undertake further training after their initial degree in order to specialize. Exactly which subjects are recognized by dental registration bodies varies according to location. Examples include:

- Anesthesiology[28] – The specialty of dentistry that deals with the advanced use of general anesthesia, sedation and pain management to facilitate dental procedures.
- Cosmetic dentistry – Focuses on improving the appearance of the mouth, teeth and smile.
- Dental public health – The study of epidemiology and social health policies relevant to oral health.
- Endodontics (also called *endodontology*) – Root canal therapy and study of diseases of the dental pulp and periapical tissues.
- Forensic odontology – The gathering and use of dental evidence in law. This may be performed by any dentist with experience or training in this field. The function of the forensic dentist is primarily documentation and verification of identity.
- Geriatric dentistry or *geriodontics* – The delivery of dental care to older adults involving the diagnosis, prevention, and treatment of problems associated with normal aging and age-related diseases as part of an interdisciplinary team with other health care professionals.
- Oral and maxillofacial pathology – The study, diagnosis, and sometimes the treatment of oral and maxillofacial related diseases.
- Oral and maxillofacial radiology – The study and radiologic interpretation of oral and maxillofacial diseases.
- Oral and maxillofacial surgery (also called *oral surgery*) – Extractions, implants, and surgery of the jaws, mouth and face.[nb 2]
- Oral biology – Research in dental and craniofacial biology
- Oral Implantology – The art and science of replacing extracted teeth with dental implants.
- Oral medicine – The clinical evaluation and diagnosis of oral mucosal diseases
- Orthodontics and dentofacial orthopedics – The straightening of teeth and modification of midface and mandibular growth.
- Pediatric dentistry (also called *pedodontics*) – Dentistry for children

- Periodontology (also called *periodontics*) – The study and treatment of diseases of the periodontium (non-surgical and surgical) as well as placement and maintenance of dental implants
- Prosthodontics (also called *prosthetic dentistry*) – Dentures, bridges and the restoration of implants.
  - Some prosthodontists super-specialize in maxillofacial prosthetics, which is the discipline originally concerned with the rehabilitation of patients with congenital facial and oral defects such as cleft lip and palate or patients born with an underdeveloped ear (microtia). Today, most maxillofacial prosthodontists return function and esthetics to patients with acquired defects secondary to surgical removal of head and neck tumors, or secondary to trauma from war or motor vehicle accidents.
- Special needs dentistry (also called *special care dentistry*) – Dentistry for those with developmental and acquired disabilities.
- Sports dentistry – the branch of sports medicine dealing with prevention and treatment of dental injuries and oral diseases associated with sports and exercise.[29] The sports dentist works as an individual consultant or as a member of the Sports Medicine Team.
- Veterinary dentistry – The field of dentistry applied to the care of animals. It is a specialty of veterinary medicine.[30][31]

History

[edit]
See also: History of dental treatments



A wealthy patient falling over because of having a tooth extracted with such vigour by a fashionable dentist, c. 1790. History of Dentistry.

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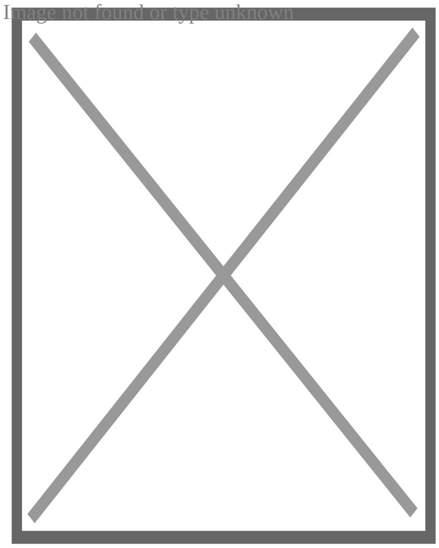


Farmer at the dentist, Johann Liss, c. 1616–17

Tooth decay was low in pre-agricultural societies, but the advent of farming society about 10,000 years ago correlated with an increase in tooth decay (cavities).[32] An infected tooth from Italy partially cleaned with flint tools, between 13,820 and 14,160 years old, represents the oldest known dentistry,[33] although a 2017 study suggests that 130,000 years ago the Neanderthals already used rudimentary dentistry tools.[34] In Italy evidence dated to the Paleolithic, around 13,000 years ago, points to bitumen used to fill a tooth[35] and in Neolithic Slovenia, 6500 years ago, beeswax was used to close a fracture in a tooth.[36] The Indus valley has yielded evidence of dentistry being practised as far back as 7000 BC, during the Stone Age.[37] The Neolithic site of Mehrgarh (now in Pakistan's south western province of Balochistan) indicates that this form of dentistry involved curing tooth related disorders with bow drills operated, perhaps, by skilled bead-crafters.[3] The reconstruction of this ancient form of dentistry showed that the methods used were reliable and effective.[38] The earliest dental filling, made of beeswax, was discovered in Slovenia and dates from 6500 years ago.[39] Dentistry was practised in prehistoric Malta, as evidenced by a skull which had a dental abscess lanced from the root of a tooth dating back to around 2500 BC.[40]

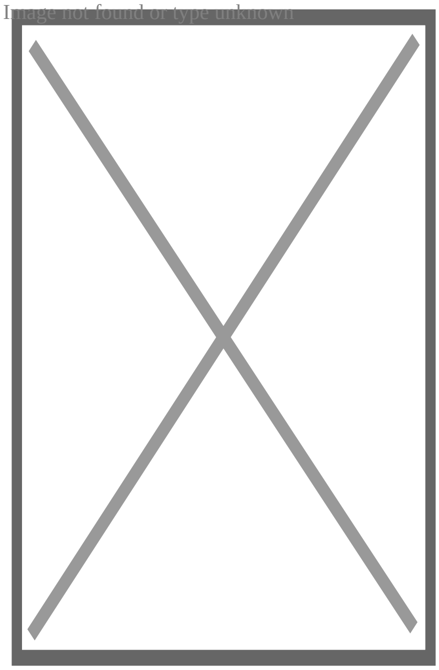
An ancient Sumerian text describes a "tooth worm" as the cause of dental caries.[41] Evidence of this belief has also been found in ancient India, Egypt, Japan, and China. The legend of the worm is also found in the *Homeric Hymns*,[42] and as late as the 14th century AD the surgeon Guy de Chauliac still promoted the belief that worms cause tooth decay.[43]

Recipes for the treatment of toothache, infections and loose teeth are spread throughout the Ebers Papyrus, Kahun Papyri, Brugsch Papyrus, and Hearst papyrus of Ancient Egypt.[44] The Edwin Smith Papyrus, written in the 17th century BC but which may reflect previous manuscripts from as early as 3000 BC, discusses the treatment of dislocated or fractured jaws.[44][45] In the 18th century BC, the Code of Hammurabi referenced dental extraction twice as it related to punishment.[46] Examination of the remains of some ancient Egyptians and Greco-Romans reveals early attempts at dental prosthetics.[47] However, it is possible the prosthetics were prepared after death for aesthetic reasons.[44]

Ancient Greek scholars Hippocrates and Aristotle wrote about dentistry, including the eruption pattern of teeth, treating decayed teeth and gum disease, extracting teeth with forceps, and using wires to stabilize loose teeth and fractured jaws.[48] Use of dental appliances, bridges and dentures was applied by the Etruscans in northern Italy, from as early as 700 BC, of human or other animal teeth fastened together with gold bands.[49][50][51] The Romans had likely borrowed this technique by the 5th century BC.[50][52] The Phoenicians crafted dentures during the 6th–4th century BC, fashioning them from gold wire and incorporating two ivory teeth.[53] In ancient Egypt, Hesy-Ra is the first named "dentist" (greatest of the teeth). The Egyptians bound replacement teeth together with gold wire. Roman medical writer Cornelius Celsus wrote extensively of oral diseases as well as dental treatments such as narcotic-containing emollients and astringents.[54] The earliest dental amalgams were first documented in a Tang dynasty medical text written by the Chinese physician Su Kung in 659, and appeared in Germany in 1528.[55][56]

During the Islamic Golden Age Dentistry was discussed in several famous books of medicine such as The Canon in medicine written by Avicenna and Al-Tasreef by Al-Zahrawi who is considered the greatest surgeon of the Middle Ages,[57] Avicenna said that jaw fracture should be reduced according to the occlusal guidance of the teeth; this principle is still valid in modern times. Al-Zahrawi invented over 200 surgical tools that resemble the modern kind.[58]

Historically, dental extractions have been used to treat a variety of illnesses. During the Middle Ages and throughout the 19th century, dentistry was not a profession in itself, and often dental procedures were performed by barbers or general physicians. Barbers usually limited their practice to extracting teeth which alleviated pain and associated chronic tooth infection. Instruments used for dental extractions date back several centuries. In the 14th century, Guy de Chauliac most probably invented the dental pelican [59] (resembling a pelican's beak) which was used to perform dental extractions up until the late 18th century. The pelican was replaced by the dental key[60] which, in turn, was replaced by modern forceps in the 19th century.[61]



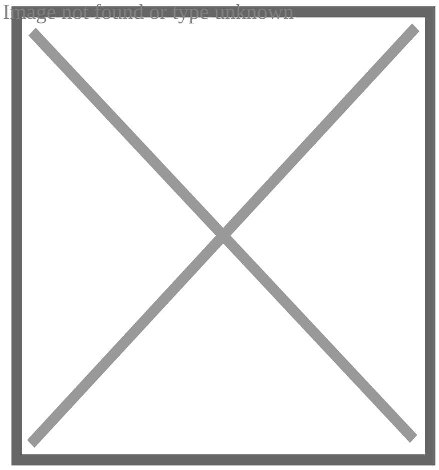
Dental needle-nose pliers designed by Fauchard in the late 17th century to use in prosthodontics

The first book focused solely on dentistry was the "Artzney Buchlein" in 1530,[48] and the first dental textbook written in English was called "Operator for the Teeth" by Charles Allen in 1685.[23]

In the United Kingdom, there was no formal qualification for the providers of dental treatment until 1859 and it was only in 1921 that the practice of dentistry was limited to those who were professionally qualified. The Royal Commission on the National Health Service in 1979 reported that there were then more than twice as many registered dentists per 10,000 population in the UK than there were in 1921.[62]

Modern dentistry

[edit]

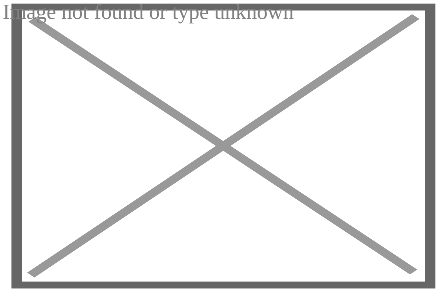


A microscopic device used in dental analysis, c. 1907

It was between 1650 and 1800 that the science of modern dentistry developed. The English physician Thomas Browne in his *A Letter to a Friend* (c. 1656 pub. 1690) made an early dental observation with characteristic humour:

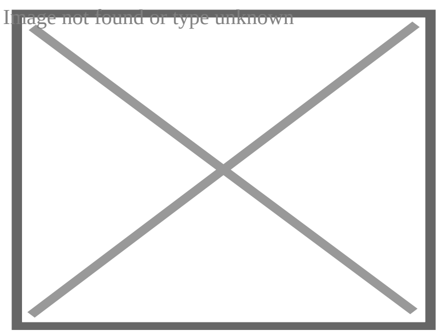
> The Egyptian Mummies that I have seen, have had their Mouths open, and somewhat gaping, which affordeth a good opportunity to view and observe their Teeth, wherein 'tis not easie to find any wanting or decayed: and therefore in Egypt, where one Man practised but one Operation, or the Diseases but of single Parts, it must needs be a barren Profession to confine unto that of drawing of Teeth, and little better than to have been Tooth-drawer unto King Pyrrhus, who had but two in his Head.

The French surgeon Pierre Fauchard became known as the "father of modern dentistry". Despite the limitations of the primitive surgical instruments during the late 17th and early 18th century, Fauchard was a highly skilled surgeon who made remarkable improvisations of dental instruments, often adapting tools from watchmakers, jewelers and even barbers, that he thought could be used in dentistry. He introduced dental fillings as treatment for dental cavities. He asserted that sugar-derived acids like tartaric acid were responsible for dental decay, and also suggested that tumors surrounding the teeth and in the gums could appear in the later stages of tooth decay.[63][64]



Panoramic radiograph of historic dental implants, made 1978

Fauchard was the pioneer of dental prosthesis, and he invented many methods to replace lost teeth. He suggested that substitutes could be made from carved blocks of ivory or bone. He also introduced dental braces, although they were initially made of gold, he discovered that the teeth position could be corrected as the teeth would follow the pattern of the wires. Waxed linen or silk threads were usually employed to fasten the braces. His contributions to the world of dental science consist primarily of his 1728 publication Le chirurgien dentiste or The Surgeon Dentist. The French text included "basic oral anatomy and function, dental construction, and various operative and restorative techniques, and effectively separated dentistry from the wider category of surgery".[63][64]



A modern dentist's chair

After Fauchard, the study of dentistry rapidly expanded. Two important books, *Natural History of Human Teeth* (1771) and *Practical Treatise on the Diseases of the Teeth* (1778), were published by British surgeon John Hunter. In 1763, he entered into a period of collaboration with the London-based dentist James Spence. He began to theorise about the possibility of tooth transplants from one person to another. He realised that the chances of a successful tooth transplant (initially, at least) would be improved if the donor tooth was as fresh as possible and was matched for size with the recipient. These principles are still used in the transplantation of internal organs. Hunter conducted a series of pioneering operations, in which he attempted a tooth transplant. Although the donated teeth never properly bonded with the recipients' gums, one of Hunter's patients stated that he had three which lasted for six years, a remarkable achievement for the period.[65]

Major advances in science were made in the 19th century, and dentistry evolved from a trade to a profession. The profession came under government regulation by the end of the 19th century. In the UK, the Dentist Act was passed in 1878 and the British Dental Association formed in 1879. In the same year, Francis Brodie Imlach was the first ever dentist to be elected President of the Royal College of Surgeons (Edinburgh), raising dentistry onto a par with clinical surgery for the first time.[66]

Hazards in modern dentistry

[edit]

Main article: Occupational hazards in dentistry

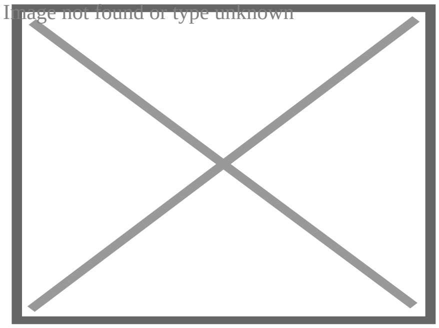
Long term occupational noise exposure can contribute to permanent hearing loss, which is referred to as noise-induced hearing loss (NIHL) and tinnitus. Noise exposure can cause excessive stimulation of the hearing mechanism, which damages the delicate structures of the inner ear.[67] NIHL can occur when an individual is exposed to sound levels above 90 dBA according to the Occupational Safety and Health Administration (OSHA). Regulations state that the permissible noise exposure levels for individuals is 90 dBA.[68] For the National Institute for Occupational Safety and Health (NIOSH), exposure limits are set to 85 dBA. Exposures below 85 dBA are not considered to be hazardous. Time limits are placed on how long an individual can stay in an environment above 85 dBA before it causes hearing loss. OSHA places that limitation at 8 hours for 85 dBA. The exposure time becomes shorter as the dBA level increases.

Within the field of dentistry, a variety of cleaning tools are used including piezoelectric and sonic scalers, and ultrasonic scalers and cleaners.[69] While a majority of the tools do not exceed 75 dBA,[70] prolonged exposure over many years can lead to hearing loss or complaints of tinnitus.[71] Few dentists have reported using personal hearing protective devices,[72][73] which could offset any potential hearing loss or tinnitus.

Evidence-based dentistry

[edit]
Main article: Evidence-based dentistry

There is a movement in modern dentistry to place a greater emphasis on high-quality scientific evidence in decision-making. Evidence-based dentistry (EBD) uses current scientific evidence to guide decisions. It is an approach to oral health that requires the application and examination of relevant scientific data related to the patient's oral and medical health. Along with the dentist's professional skill and expertise, EBD allows dentists to stay up to date on the latest procedures and patients to receive improved treatment. A new paradigm for medical education designed to incorporate current research into education and practice was developed to help practitioners provide the best care for their patients.[74] It was first introduced by Gordon Guyatt and the Evidence-Based Medicine Working Group at McMaster University in Ontario, Canada in the 1990s. It is part of the larger movement toward evidence-based medicine and other evidence-based practices, especially since a major part of dentistry involves dealing with oral and systemic diseases. Other issues relevant to the dental field in terms of evidence-based research and evidence-based practice include population oral health, dental clinical practice, tooth morphology etc.



A dental chair at the University of Michigan School of Dentistry

Ethical and medicolegal issues

[edit]

Dentistry is unique in that it requires dental students to have competence-based clinical skills that can only be acquired through supervised specialized laboratory training and direct patient care.[75] This necessitates the need for a scientific and professional basis of care with a foundation of extensive research-based education.[76] According to some experts, the accreditation of dental schools can enhance the quality and professionalism of dental education.[77][78]

See also

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icon

- Image not found or type unknown Medicine portal
- Dental aerosol
- Dental instrument
- Dental public health
- Domestic healthcare:
  - Dentistry in ancient Rome
  - Dentistry in Canada
  - Dentistry in the Philippines
  - Dentistry in Israel
  - Dentistry in the United Kingdom
  - Dentistry in the United States
- Eco-friendly dentistry
- Geriatric dentistry
- List of dental organizations
- Pediatric dentistry
- Sustainable dentistry
- Veterinary dentistry

Notes

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1. **^** Whether Dentists are referred to as "Doctor" is subject to geographic variation. For example, they are called "Doctor" in the US. In the UK, dentists have traditionally been referred to as "Mister" as they identified themselves with barber surgeons more than physicians (as do surgeons in the UK, see Surgeon#Titles). However more UK dentists now refer to themselves as "Doctor", although this was considered to be potentially misleading by the British public in a single report (see Costley and Fawcett 2010).
2. **^** The scope of oral and maxillofacial surgery is variable. In some countries, both a medical and dental degree is required for training, and the scope includes head and neck oncology and craniofacial deformity.

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Dentistry

Specialties	Endodontics Oral and maxillofacial pathology Oral and maxillofacial radiology Oral and maxillofacial surgery Orthodontics and dentofacial orthopedics Pediatric dentistry Periodontics Prosthodontics Dental public health Cosmetic dentistry Dental implantology Geriatric dentistry Restorative dentistry Forensic odontology Dental traumatology Holistic dentistry
Dental surgery	Dental extraction Tooth filling Root canal therapy Root end surgery Scaling and root planing Teeth cleaning Dental bonding Tooth polishing Tooth bleaching Socket preservation Dental implant
Organisations	American Association of Orthodontists British Dental Association British Dental Health Foundation British Orthodontic Society Canadian Association of Orthodontists Dental Technologists Association General Dental Council Indian Dental Association National Health Service

By country

- Canada
- Philippines
- Israel
- United Kingdom
- United States

See also

- Index of oral health and dental articles
- Outline of dentistry and oral health
- Dental fear
- Dental instruments
- Dental material
- History of dental treatments
  - Ancient Rome
- Infant oral mutilation
- Mouth assessment
- Oral hygiene

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Cleft lip and cleft palate

Related specialities

- Advance practice nursing
- Audiology
- Dentistry
- Dietetics
- Genetics
- Oral and maxillofacial surgery
- Orthodontics
- Orthodontic technology
- Otolaryngology
- Pediatrics
- Pediatric dentistry
- Physician
- Plastic surgery
- Psychiatry
- Psychology
- Respiratory therapy
- Social work
- Speech and language therapy

Related syndromes

- Hearing loss with craniofacial syndromes
- Pierre Robin syndrome
- Popliteal pterygium syndrome
- Van der Woude syndrome

National and international organisations	○ Cleft Lip and Palate Association ○ Craniofacial Society of Great Britain and Ireland ○ Interplast ○ North Thames Regional Cleft Lip and Palate Service ○ Operation Smile ○ Overseas Plastic Surgery Appeal ○ Shriners Hospitals for Children ○ Smile Train ○ Transforming Faces Worldwide ○ Smile Angel Foundation (China)

Dental schools

American dental schools

- UAB
- Arizona
- Augusta (DCG)
- Boston U (Goldman)
- California (UCLA, UCSF)
- Case Western Reserve
- Colorado
- Columbia
- Connecticut
- Creighton
- Detroit Mercy
- East Carolina
- Florida
- Harvard
- Howard
- Illinois–Chicago
- Indiana
- Iowa
- Kentucky
- Lake Erie
- Loma Linda
- Louisville
- LSU Health–New Orleans
- Marquette
- Maryland–Baltimore
- Meharry
- Michigan
- Midwestern
- Minnesota
- Mississippi
- Missouri–Kansas City
- Nebraska–Medical Center
- Nevada–Las Vegas
- New England
- NYU
- SUNY (Buffalo, Stony Brook)
- North Carolina
- Nova
- Ohio State
- Oklahoma
- Oregon
- Pacific (Dugoni)
- Penn
- Pitt
- Puerto Rico
- Rochester
- Pacific Northwest
- Rutgers
- South Carolina
- Southern California (Ostrow)

Defunct American dental schools	○ Emory ○ Fairleigh Dickinson ○ Georgetown ○ Harris ○ Loyola ○ Northwestern ○ Ohio College ○ Oral Roberts ○ Pennsylvania College ○ Wash U
Canadian dental schools	○ Alberta ○ British Columbia ○ Dalhousie ○ Laval ○ Manitoba ○ McGill ○ Montréal ○ Saskatchewan ○ Toronto ○ Western
British dental schools	○ Aberdeen ○ Barts and The London School of Medicine and Dentistry ○ Glasgow ○ Guy's, King's & St Thomas's ○ Liverpool ○ Newcastle ○ Peninsula College of Medicine and Dentistry ○ UCL Eastman Dental Institute
Australian and New Zealand dental schools	○ Sydney ○ Melbourne ○ Adelaide ○ Charles Sturt University ○ Griffith University ○ James Cook ○ La Trobe ○ Queensland ○ Western Australia ○ University of Otago

South Korean dental schools

- Chonbuk
- Chonnam
- Chosun
- Dankook
- Gangneung-Wonju
- Kyung Hee
- Kyungpook
- Pusan
- Seoul
- Wonkwang
- Yonsei

Medicine

Surgery

- Cardiac surgery
- Cardiothoracic surgery
- Endocrine surgery
- Eye surgery
- General surgery
  - Colorectal surgery
  - Digestive system surgery
- Neurosurgery
- Oral and maxillofacial surgery
- Orthopedic surgery
- Hand surgery
- Otolaryngology
  - ENT
- Pediatric surgery
- Plastic surgery
- Reproductive surgery
- Surgical oncology
- Transplant surgery
- Trauma surgery
- Urology
  - Andrology
- Vascular surgery

Internal medicine

- Allergy / Immunology
- Angiology
- Cardiology
- Endocrinology
- Gastroenterology
  - Hepatology
- Geriatrics
- Hematology
- Hospital medicine
- Infectious diseases
- Nephrology
- Oncology
- Pulmonology
- Rheumatology

Obstetrics and gynaecology

- Gynaecology
- Gynecologic oncology
- Maternal–fetal medicine
- Obstetrics
- Reproductive endocrinology and infertility
- Urogynecology

Specialties and subspecialties

Diagnostic

- Radiology
  - Interventional radiology
  - Neuroradiology
  - Nuclear medicine
- Pathology
  - Anatomical

Medical education

- Medical school
- Bachelor of Medicine, Bachelor of Surgery
- Bachelor of Medical Sciences
- Master of Medicine
- Master of Surgery
- Doctor of Medicine
- Doctor of Osteopathic Medicine
- MD–PhD
    - Medical Scientist Training Program

Related topics

- Alternative medicine
- Allied health
- Molecular oncology
- Nanomedicine
- Personalized medicine
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- Therapy
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- Veterinary medicine
- Physician
    - Chief physician
- History of medicine

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